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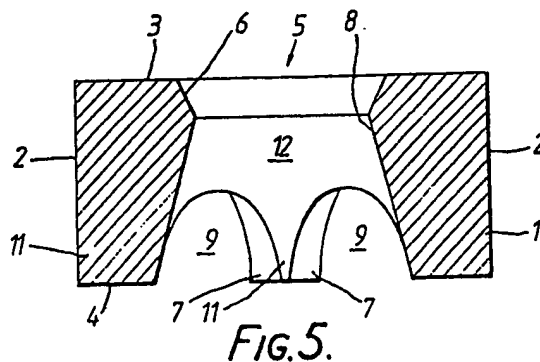
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(54) Armour blocks for protecting water
bordering structures

(57) A block (1) comprises a body having upper and lower faces (3, 4) and side faces (2) which are arranged to provide the body with a generally regular polygonal section, e.g. as shown a square section. Each of the faces (3, 4 and 2) is provided with an opening (5, 10, 9) communicating with an internal void (12). The openings (9) in the side faces (2) extend to the lower face to define with the opening (10) in the lower face (4) and the void (12) leg-like projections (11) by which the body is supported on the surface (e.g. a breakwater) to be protected thereby.

As shown, the void (12) may be generally frusto-conical and the openings (5, 10, 9) may taper in the direction of the void (12), to facilitate construction.. The body may be made of concrete or a suitable plastics material with a massive filler and a plurality of such bodies are arranged in a regular array to form a protective layer on the surface to be protected thereby.



SPECIFICATION

Improvements in and relating to protective blocks

5 This invention relates to protective blocks, generally known as armour blocks, such as may be used for the protection of structures bordered by water, such as dams, breakwaters and other littoral structures.

Armour blocks are used for facing such structures
10 to protect the structure from the potentially damaging forces of the water, the blocks generally being placed upon an inclined surface of the structure and built up to form the protective facing.

Such blocks are generally either massive, for
15 example of the order of 15 to 25 tons, wave energy of the water being dissipated in interstices between the blocks and the mass of the blocks being sufficient to prevent them being moved by the water, or substantially less massive, e.g. of the order of 2 to 5
20 tons, and each provided with an internal void and openings communicating therewith, the wave energy being dissipated within the blocks. The latter type of block is generally cuboid with plain faces, an internal void and an opening centrally in each face
25 communicating with the void. The manufacture of such blocks can be complex and particularly in relation to the formwork required to define the internal void. Additionally, because the block is supported on a plane face, to ensure that the block is
30 stably positioned on the surface to be protected, the surface has to be made of relatively small rocks or stones.

According to one aspect of the present invention there is provided a protective block comprising a
35 body having an upper face, a lower face, and a plurality of side faces mutually orientated to define a generally polygonal section, and internal void, openings in the upper and lower faces communicating with the void, and openings in the
40 side faces communicating with the void and extending to the lower face to define with the void and the opening in the lower face a plurality of leg-like projections at least in the lower part of the body.

45 The openings in the side faces may be positioned within the lateral edges of the side faces so that the leg-like projections are aligned with the edges between adjacent side faces or the openings may extend into adjacent side faces so that the
50 projections lie within the lateral edges of the side faces.

The or some of the openings advantageously communicate with the void by passages of inwardly reducing section, e.g. defined by generally
55 frusto-conical surfaces, and the openings may have a curved or polygonal or part curved part linear shape.

The polygon defined by the side faces is advantageously a regular polygon and such that a
60 plurality of like blocks can be arranged in a regular array.

According to another aspect of the present invention there is provided a protective layer comprising a plurality of blocks as defined above,
65 the blocks being arranged in a regular array on a

surface to be protected thereby with the lower faces of adjacent blocks being generally coplanar.

An embodiment according to the invention will now be described, by way of example only, with
70 reference to the accompanying drawings, in which:

Figure 1 shows an embodiment of a block according to the invention, in side elevation;

Figure 2 is a plan view of the block of *Figure 1*;

Figure 3 is a sectional view along the line A-A of

75 *Figure 2*;

Figure 4 is a sectional view along the line B-B of *Figure 2*;

Figure 5 is a sectional view along the line C-C of *Figure 2*;

80 *Figure 6* is an underneath plan view of the block of *Figure 1*; and

Figure 7 is a diagrammatic vertical section through an array of blocks as shown in *Figures 1* to *6* in use.

The protective block 1 shown in *Figures 1* to *6* of
85 the drawings comprises a body having an upper face 3 having an opening 5 therein, a lower face 4 having an opening 10 therein, and a plurality of side faces 2 which as shown are generally planar. The side faces 2 are mutually orientated to define a generally
90 polygonal section, the polygon having, in this embodiment, four equal sides.

The block 1 is provided with an internal void 12, defined by a generally frusto-conical surface 8, which opens in the lower surface at the opening 10, and which communicates with opening 5 in the
95 upper face by a passage 6 of inwardly reducing section.

The block also has a plurality of side openings 9, one provided in the lower part of each side face 2.
100 The side openings 9 communicate with the void 12 and extend into the plane of the lower face 4 to define with the opening 10 and void 12 leg-like projections 11 in the lower part of the block, by which the block is supported on the surface of the structure to be
105 protected thereby. The leg-like projections 11 enable the block to be stably seated on the surface, while still maintaining a void within the body, even when the surface is composed of relatively large rocks or stones. As shown, the side openings 9 are
110 semi-circular, communicate with the void 12 by semi-circular passages of inwardly reducing section defined by frusto-conical surfaces 7, and extend to about half the height of the block.

It will be appreciated that the generally
115 frusto-conical shaping of the surfaces 6, 7 and 8 facilitate construction of the formwork defining these surfaces and facilitate its removal after production of a block.

Although as described above the block is square in
120 section, it will be appreciated that it may have other polygonal shapes, but preferably has a regular polygonal shape 2.

As described above, each leg-like projection 11 is in line with a side edge between adjacent side faces 2, the side openings 9 being provided therebetween. In a modification, the projections may extend centrally of each side face, with each side opening 9 extending across a side edge between adjacent side faces.

130 The openings 5, 10 and 9, which are shown as

circular and semi-circular respectively, may alternatively have other curved or linear profiles, such for example as parabolic or polygonal profiles. Equally the edges of the block between the faces thereof may be radiussed or bevelled and the upper and side faces may be curved or bowed rather than planar.

While as described above, the side faces 2 are generally perpendicular to the upper and lower faces of the block, they may alternatively be inclined so that the block is generally frusto-pyramidal with either the upper or the lower face forming the base of the pyramid.

The block may be made of any suitable material, such for example as materials currently in use for armour blocks, e.g. concrete, which may or may not be reinforced, or may be made of a suitable plastics material with a massive filler.

While as shown the side openings 9 extend to about half the height of the block, the upper part of the block may be enlarged or reduced in volume relative to the lower part of the block, possibly with a corresponding change in thickness of the leg-like projections, so as to vary the mass of the block and the ratio of the mass of the block to the volume of the internal void. A block as described above may, for example, weigh between 2 and 25 or more tons.

In use of the above described block, as shown in Figure 7, a plurality of like blocks 1 are arranged in a regular array on an inclined surface 14 which is to be protected thereby. The blocks 1 are arranged with the lower faces of adjacent blocks generally coplanar. Preferably at the lower end of the surface 14 a footing 15 is provided which is formed with an inclined face 16a against which the side faces of the lowermost blocks 1 rest. The particular regular array selected for the blocks will depend on the transverse section of the blocks. For example, for blocks having a square transverse section, as shown, the array may comprise horizontal rows of blocks with the blocks in adjacent rows aligned to create perpendicular rows extending up the surface 14. Alternatively, the blocks in adjacent rows (which may be horizontal rows or rows extending up the surface 14) may be offset or staggered relative to each other. Adjacent blocks in the same row and/or adjacent rows may be juxtaposed or spaced apart and, when spaced apart spacer blocks may be provided between the spaced blocks.

CLAIMS

1. A protective block comprising a body having an upper face, a lower face, and a plurality of side faces mutually orientated to define a generally polygonal section, an internal void, openings in the upper and lower faces communicating with the void, and openings in the side faces communicating with the void and extending to the lower face to define with the void and the opening in the lower face a plurality of leg-like projections at least in the lower part of the body.

2. A block as claimed in claim 1, wherein the polygon defined by the side faces is a regular polygon and such that the body can be arranged

together with a plurality of like bodies in a regular array.

3. A block as claimed in either claim 1 or claim 2, wherein at least some of the openings communicate with the void by passages which reduce in section in the direction of the void.

4. A block as claimed in any one of the preceding claims, wherein the opening in the upper face is provided centrally within the periphery of the face.

5. A block as claimed in any one of the preceding claims, wherein the openings in the side faces are arranged laterally within the periphery of each face.

6. A block as claimed in any one of claims 1 to 4, wherein each opening in the side faces extends laterally into two adjacent side faces.

7. A block as claimed in any one of the preceding claims, wherein the void is generally frusto-conical.

8. A block as claimed in any one of the preceding claims, wherein the openings have a polygonal, a curvilinear or a part linear part curved shape.

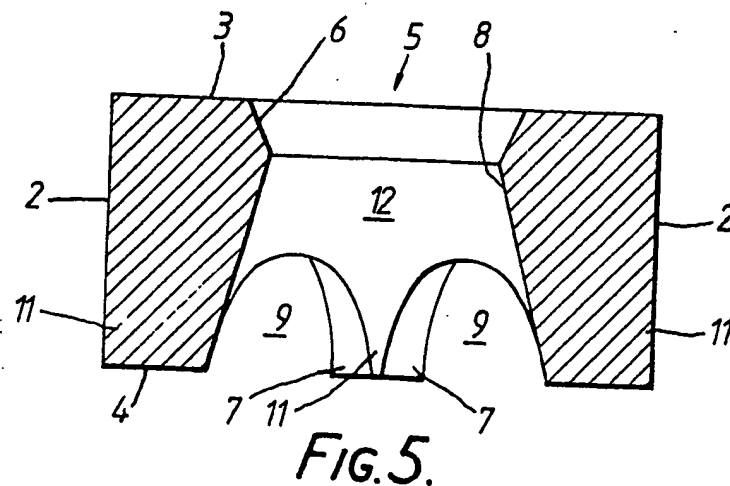
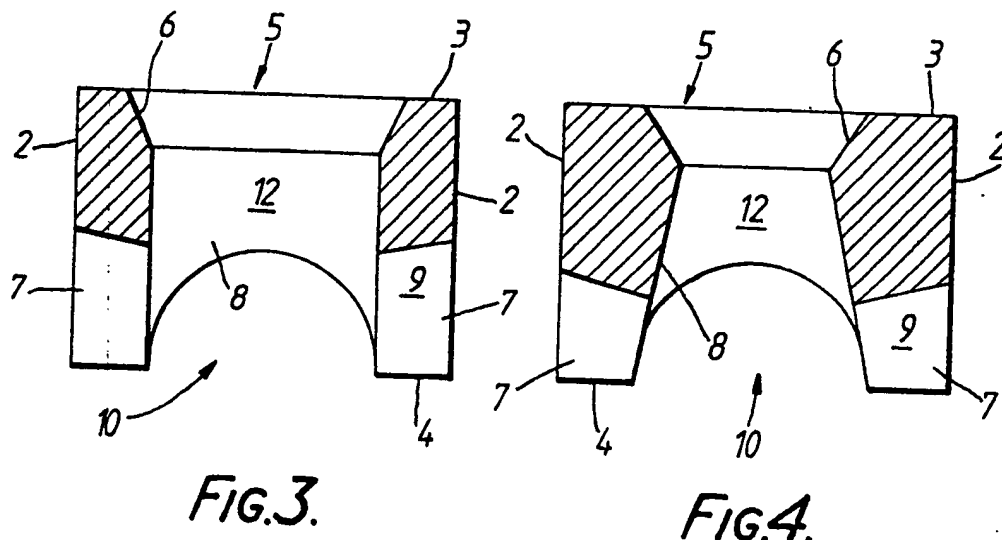
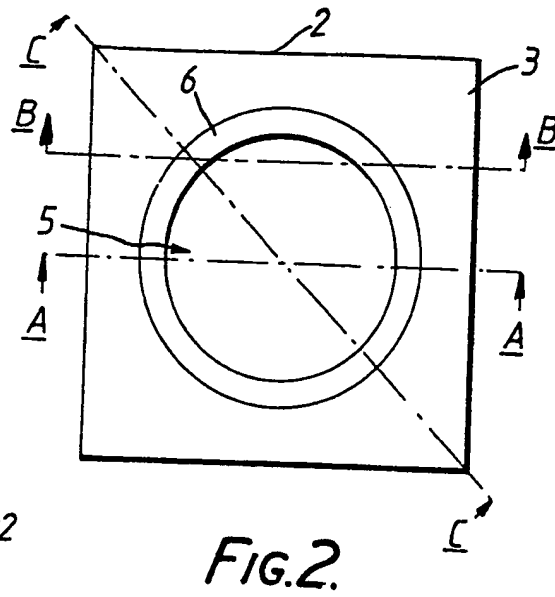
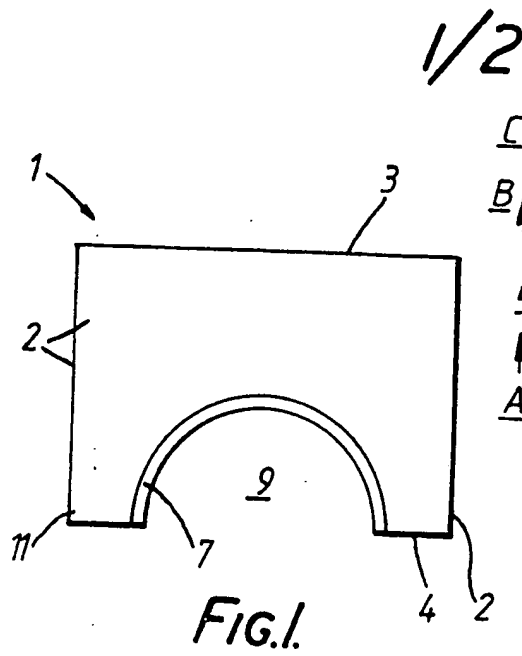
9. A block as claimed in any one of the preceding claims, wherein the body is made of concrete.

10. A block as claimed in any one of claims 1 to 8, wherein the body is made of a plastics material.

11. A protective block substantially as herein described with reference to the accompanying drawings.

12. A protective layer comprising a plurality of blocks as claimed in any one of the preceding claims, the blocks being arranged in a regular array on a surface to be protected thereby with the lower faces of adjacent blocks being generally coplanar.

13. A protective layer substantially as herein described with reference to the accompanying drawings.



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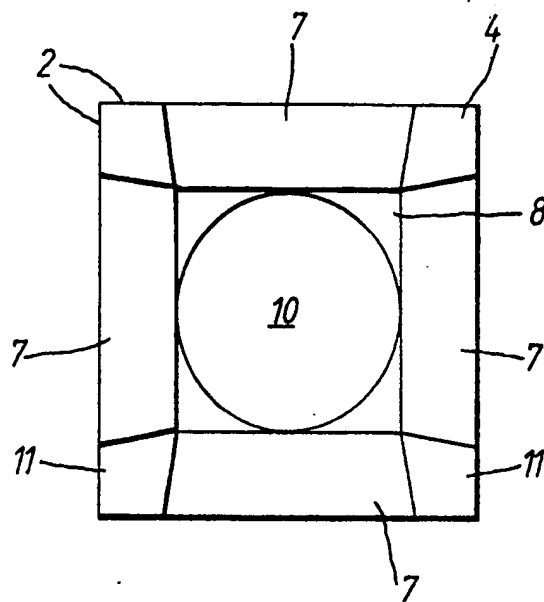


FIG. 6.

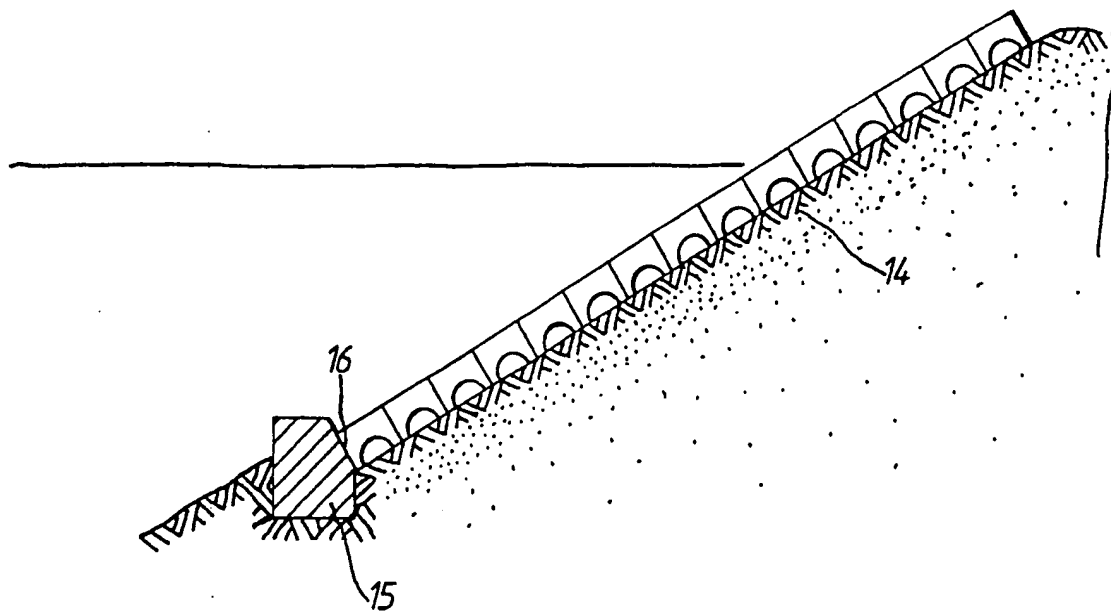


FIG. 7.